BIOLOGICAL EVALUATION

SPRUCE BUDWORM INFESTATIONS

Egg Mass Sampling

1962

Navajo Indian Reservation
Arizona and New Mexico

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This report summarizes the 1962 spruce budworm egg mass survey on the Chuska Mountains of the Navajo Indian Reservation. The area of infestation is equally divided between Arizona and New Mexico. For the third consecutive year, egg masses per 1,000 square inches of Douglas-fir foliage have been sampled on four plots distributed throughout 100,000 acres of infested type. Data collected from these surveys supplement ground and aerial observations for predicting expected damage the following year.

The budworm infestation was first reported on the Reservation in 1955. At that time, it covered about 12,500 acres.[1/] By 1959, the infestation had extended to over 83,000 acres.[2/] The current estimate of infested host type on the Chuska Mountains is about 100,000 acres (see map).

Foliage sampling started on August 29 and was completed August 30, 1962. All four plots on the Navajo Reservation showed marked increases over last year in new, unparasitized egg masses per 1,000 square inches of foliage sampled (Table 1). The average increase was 116.0 percent for all plots. This increase in egg mass densities and expected increase in next year's larval population should result in heavier defoliation of host type on the Reservation in 1963. Direct control measures are recommended to suppress this outbreak.

1/ C. L. Massey. 1955. The Spruce Budworm Situation in Arizona and New Mexico, 1955. Unpublished Report.

2/ D. A. Pierce. 1959. Detection Survey - Forest Insects, Navajo Indian Reservation, Arizona and New Mexico, August 1959. Unpublished Report.

TABLE I

Comparison of New Unparasitized Spruce Budworm Egg Masses Per 1,000 Square Inches of Foliage for Each of Four Plots Sampled on the Navajo Indian Reservation During 1961 and 1962.

Plot Location	New Unparasitized Egg Masses per 1,000 Sq. In. of Foliage		Percent Increase
Navajo Indian Reservation	1961[1/]	1962	
Washington Pass	25.3	41.2	63
Toadlena	19.7	28.1	43
Burn	24.5	55.4	126
Roof Butte	22.0	73.3	233
Average	22.9	49.5	116

1/ J. F. Chansler. 1961. Biological Evaluation, Spruce Budworm Infestations, Egg Mass Sampling, 1961, Carson and Santa Fe National Forests and Adjacent Private Land and Navajo Indian Reservation. Unpublished Report.

Technical Information

Insect: Spruce budworm, Choristoneura fumiferana (Clem.)

Host Trees: Douglas-fir, Pseudotsuga menziesii; white fir, Abies concolor; corkbark fir, Abies arizonica; blue spruce, Picea pungens; and Engelmann spruce, Picea engelmanni. Damage is confined for the most part to Douglas-fir and true firs.

Type of Damage: Varying degrees of damage are exhibited by the infestation. Light to heavy current defoliation was observed while taking the foliage samples.

Extent and Location of Infestation: About 100,000 acres are infested with the spruce budworm on the Navajo Indian Reservation. The infestation extends throughout the susceptible host type of the Chuska Mountains.

Biological Data

Sampling: The same four plots and most of the same trees were sampled for egg masses in 1962 as in 1961. Each plot consisted of five dominant or co-dominant Douglas-fir trees. Two men sampled the infested trees by removing two lower mid-crown branches, using a 20-foot aluminum ladder and pruning saw. Foliage on one side of each branch was clipped and discarded. All of the remaining foliage was measured, clipped, and placed in

numbered burlap bags. Thus, the equivalent of one entire branch per tree or five entire branches per plot were sampled.

The foliage was taken to Santa Fe, New Mexico, where four female biological aids examined the foliage for egg masses. The aids were not required to differentiate spruce budworm egg masses from other material found on Douglas-fir needles. Hence, all needles with foreign material adhering to them were removed and placed in small pill boxes. Later an entomologist examined this material and separated budworm egg masses from other extraneous material. The egg masses were then segregated with the aid of a microscope into two classes: unparasitized and parasitized. Egg masses with 50% or more of the eggs parasitized were classified as "parasitized," while those with less than 50% were classified as "unparasitized." Table 2 summarizes data gathered from these samples. A summary of the average number of new, unparasitized egg masses per 1,000 square inches of foliage sampled for the years 1960, 1961, and 1962 is given in Table 3.

TABLE 2

Summary of Spruce Budworm Egg Mass Counts from Four Douglas-fir Plots on the Navajo Indian Reservation, 1962.

Plot Location	Sq. In. Foliage Examined	New Egg Masses per 1,000 sq. in. foliage, 1962	
		Unpara.	Para.
Navajo Indian Reservation			
Washington Pass	5,454	41.2	9.0
Toadlena	5,644	28.1	0.8
Burn	10,945	55.4	0.6
Roof Butte	7,076	73.3	1.8
Total	29,119	198.0	12.2
Average	7,279	49.5	3.0

TABLE 3

Summary of New, Unparasitized Egg Masses sampled from Four Plots on the Navajo Indian Reservation for 1960, 1961, and 1962.

Location	Average Number of New Unparasitized Egg Masses per 1,000 Square Inches of Foliage Sampled in 4 Plots		
	1960	1961	1962
Navajo Indian Reservation	33.9	22.9	49.5

Results

Egg Mass Densities: New, unparasitized egg masses increased on all four plots sampled in 1962. When compared with samples taken in 1961, the average increase was 116.0 percent.

A total of 29,119 square inches of Douglas-fir foliage was collected and examined for budworm egg masses in 1962 (Table 2). Foliage examined averaged 7,279 square inches per plot. New unparasitized egg masses averaged 49.5 per 1,000 square inches of foliage for the four plots sampled.

Egg Parasitism: New, parasitized egg masses averaged 3.0 per 1,000 square inches of foliage for the four plots sampled.

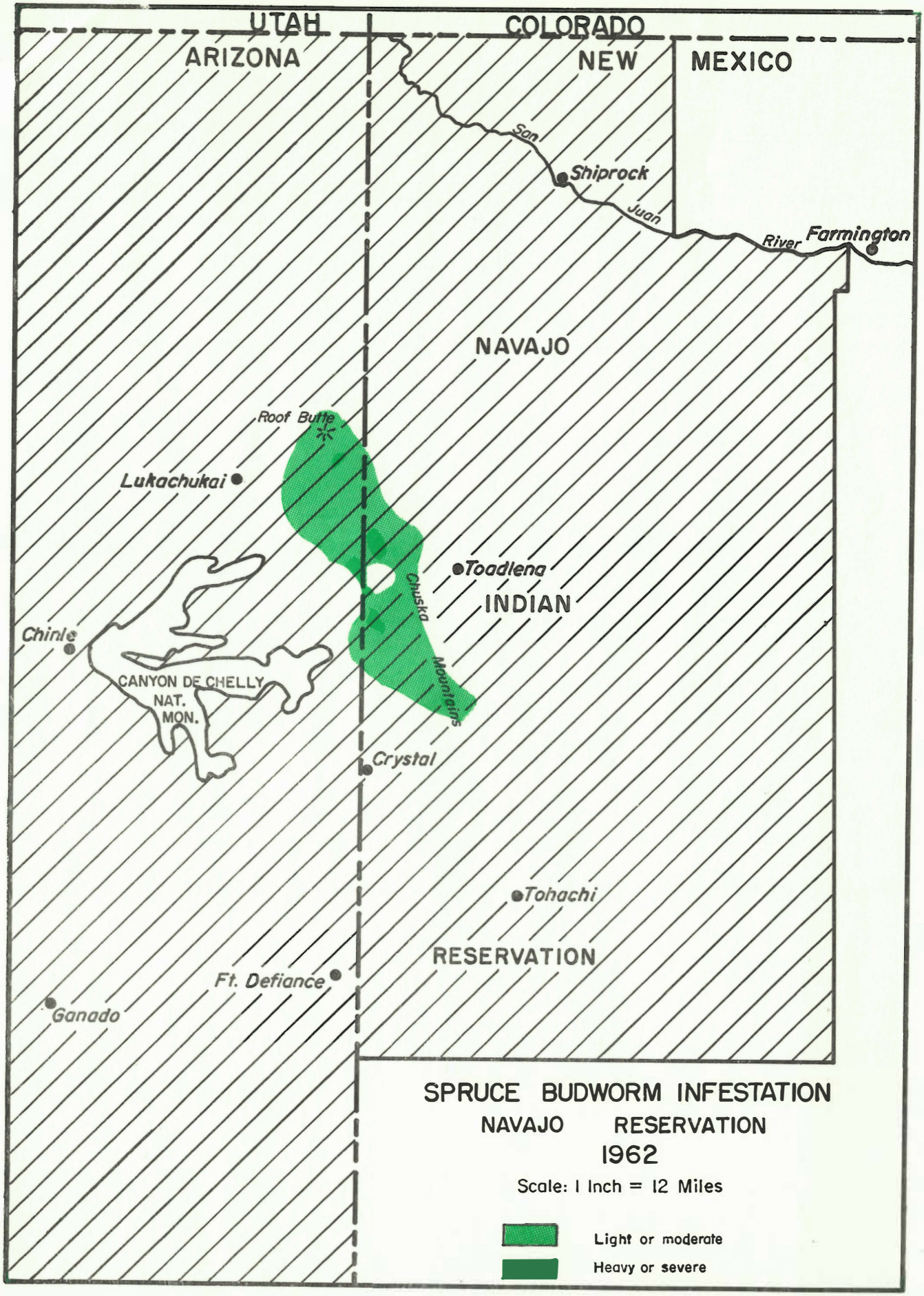
Conclusion

The relationship between egg mass densities and defoliation has been used as a basis for predicting population trends of spruce budworm in other western regions.1/ Whether or not this relationship exists for budworm populations in Arizona and New Mexico is not known. Defoliation estimates are lacking for the Navajo Indian Reservation. Ground and aerial observations, however, indicate that intensive damage has occurred in previous years when egg mass densities were lower than those encountered this year. Thus, the high number of 1962 egg masses indicates intensive damage on the Navajo Indian Reservation in 1963.

Many of the trees in the infested area are in poor condition due to the accumulated effect of yearly feeding by the budworm. Top killing, increment loss, and tree mortality are expected to continue unless direct control measures are undertaken to suppress the infestation.

1/ V. M. Carolin and W. K. Coulter. 1959. Research Findings Relative to the Biological Evaluation of Spruce Budworm Infestations in Oregon. Unpublished.

T. T. Terrell. 1962. Spruce Budworm Infestations in the Northern Region, 1961. Unpublished.


UTAH
COLORADO
ARIZONA
NEW
MEXICO
San
Juan
River
Shiprock
Farmington
NAVAJO
Roof Butte
Lukachukai
Toadlena
INDIAN
Chuska
Mountains
Chinle
CANYON DE CHELLY
NAT.
MON.
Crystal
Tohachi
RESERVATION
Ft. Defiance
Ganado
SPRUCE BUDWORM INFESTATION
NAVAJO RESERVATION
1962
Scale: 1 Inch = 12 Miles
Light or moderate
Heavy or severe